Total No. of Questions : 10]

SEAT No. :

P1663

[Total No. of Pages : 2

[5460]-190
T.E.(Computer Engineering)
DIGITAL SIGNAL PROCESSING APPLICATIONS
(2012 Pattern)

Time : 3 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
2) *Neat diagram must be drawn wherever necessary.*
3) *Assume suitable data if necessary.*

Q1) a) How the linear convolution operation can be used to represent any arbitrary DT sequence and a DT system? **[5]**

b) Obtain the Z — Transform (ZT) of a DT signal - **[5]**
$x(n) = -a^n u(-n-1)$ Sketch the ROC.

OR

Q2) a) A CT signal having frequency 50 Hz is sampled at a rate of 1200 samples/sec. Obtain - **[5]**

i) Number of samples per cycle.
ii) Digital/Discrete frequency f and ω.
iii) Minimum sampling rate to avoid aliasing effect.
iv) Period of a DT signal.

b) State and prove the periodicity property of Fourier Transform (FT). Define it for DFT. **[5]**

Q3) a) What is the convolution property of DFT? Compare Linear Convolution with Circular Convolution. **[5]**

b) Derive the first stage of Radix-2 DIT FFT Algorithm. **[5]**

OR

Q4) a) State the relation between FT and DFT. Define N point DFT by means of twiddle factor and obtain the twiddle factors for 4 point DFT. **[5]**

b) Obtain the system function and impulse response of the given system described as- **[5]**

$$y(n)-\frac{5}{6}y(n-1)+\frac{1}{6}y(n-2)=x(n)-\frac{1}{2}x(n-1)$$

P.T.O.

Q5) a) Derive the Direct Form - I IIR filter structure from the system function H(Z) and realize it using multipliers, adders and delay elements. **[9]**

b) Obtain and realize linear phase FIR filter structure having impulse response. **[9]**

$$h(n)=\delta(n)+½\,\delta(n-1)-\frac{1}{4}\delta(n-2)+½\,\delta(n-3)+\delta(n-4)$$

OR

Q6) a) Obtain and draw the cascade form realization for IIR filter having transfer function - **[9]**

$$H(Z)=\frac{Z^2-Z}{Z^2-0.2Z-0.15}$$

b) Represent the mathematical form of M^{th} order FIR filters by means of system function H(Z). Draw the Direct Form filter structure and determine the number of multipliers, adders and delay elements required to realize the filter. **[9]**

Q7) a) Explain the features of SHARC DSP processor. List the number of DAGs with its capabilities and memory pointer registers supported by DAG. **[8]**

b) What is OMAP? Explain the features and applications of OMAP in brief. **[8]**

OR

Q8) a) Compare conventional Microprocessor with DSP Processor architecture. Draw and explain basic building blocks of DSP processor. **[8]**

b) Draw and explain the SIMD (Single Instruction Multiple Data) architecture of SHARC DSP processor. **[8]**

Q9) a) Draw and explain Human Speech Model in speech synthesis and recognition. **[8]**

b) How digital image is represented by means of digital computer? How gray scale image is different than colour image? What is Histogram of an image? **[8]**

OR

Q10)a) What is Companding? What is its significance in audio processing? What is the impact of data rate on sound quality? **[8]**

b) With mathematical form, explain any two gray level transforms used for image enhancement. **[8]**